LANDOWNER RELATIONS PROGRAM
COOPERATIVE STEWARDSHIP AGREEMENT
FOR HABITAT IMPROVEMENT

THIS COOPERATIVE STEWARDSHIP AGREEMENT for habitat improvement is entered into between Boulder Ranch LLC, as represented by [redacted] ("Cooperator") and the State of Arizona through the Arizona Game and Fish Commission ("Commission") and its administrative agency the Arizona Game and Fish Department ("Department") (collectively "Parties" and singularly "Party") for the purpose of executing a Cooperative Habitat Improvement Project on lands owned or controlled by the Cooperator ("Subject Property"), as illustrated in the attached Exhibit A, incorporated herein by reference.

WHEREAS, the Commission is authorized to enter into this Agreement pursuant to A.R.S. § 17-231(B) (7);

WHEREAS, said Subject Property provides mutual benefits to the Cooperator and wildlife, and it is the mutual desire of the Department and Cooperator to cooperate for the common benefit of wildlife and the public interests of the people of Arizona;

WHEREAS, the Parties agree that the goods or services provided by the Department will be used by the Cooperator for a public purpose as described herein, and that the benefit derived to the public as the result of such goods or services will equal or exceed the value of the goods or services;

NOW THEREFORE, in consideration of the mutual promises and other good and valuable consideration contained herein, the Department and the Cooperator agree to implement the following described Habitat Improvement Project on the Subject Property:

Project Description:

Provide funding for the lessee to conduct maintenance to improve the following nine existing dirt stock tanks: "Mormon Tank" (BLM), "Hidden Tank #2" (BLM), "Joe's Tank" (ASLD), "Moon Crater Tank" (ASLD), "Juniper Tank" (ASLD), "Shamrock Tank" (ASLD), "Willow Tank" (ASLD), "Packer Tank" (ASLD), and "Yellow Jacket Tank" (ASLD). Maintenance will include removing sedimentation and debris from within the existing footprint of the tanks, using that sediment to repair the berms where needed, and treating with bentonite clay where appropriate to better hold water throughout the dry season.

The recipient of this agreement is providing cost-share funds estimated at $13,340 via equipment, fuel, transportation, and labor for the maintenance of these nine tanks. EAC M15-0706045845.

A. The Arizona Game and Fish Department shall:

1. Work with the Cooperator to complete the project per the Project Description for the purpose of wildlife habitat improvement.

2. Provide funding to the Cooperator in an amount not-to-exceed, thirteen thousand dollars ($13,000.00) for reimbursement of materials and labor to perform the habitat improvements described in the Project Description. All labor using heavy equipment is included in the aforementioned price.

3. Payment shall be made upon receipt of itemized invoice(s) from the Cooperator to the Department.

4. Annually monitor and evaluate Project effectiveness and wildlife use during the term of this Agreement.

B. The Cooperator shall:

1. Complete the Project described in the project description in the project area depicted in Exhibit A. Be responsible for all labor, equipment, and material costs over and above those supplied by the Department ($13,000.00) through this Agreement.

2. Adhere here to the BLM Memorandum 6716(PO10) 4100(PO10), which states:
"As a stipulation,
   - Notify, in writing, the Bureau of Land Management (BLM), Hassayampa Field Office (HFO) Assistant Field Manager, Archaeologist, and/or Natural Resources Specialist of intent to start maintenance operations at least one week prior to expected start date of maintenance activities.
   - No new ground disturbing activities shall occur outside of existing footprints of roads and range improvements.
   - All equipment and materials shall be transported on existing roads and no new roads are authorized."

3. Submit itemized invoices to the Department for reimbursement of costs incurred, including any delivery, to complete the Project.

4. Construct and install the project in accordance with approved NRCS designs, standards, and specification (Exhibit B) to the maximum extent practicable.

5. Should the property rights to the Subject Property be transferred to another Party during the term of this Agreement, the terms and conditions of this Agreement shall be transferred with the property to such other Party.

C. The Department and the Cooperator mutually agree:

1. That unless otherwise terminated as provided herein, this Agreement shall extend for a period of five (5) years from the date of last signature on this Agreement. Project progress will be monitored and a final assessment of the project's effectiveness will be completed jointly by the Parties.

2. Nothing in this Agreement shall be construed as obligating the Department in any contract or other obligation for the future payment of money in excess of appropriation authorized by law.

3. Either Party may terminate this Agreement upon sixty (60) days written notice to the other Party. Upon termination, all work performed pursuant to this Agreement shall cease and Cooperator shall not incur any new obligations for the terminated portion of the Agreement and shall cancel as many outstanding obligations as possible. The Department shall allow full credit to the Cooperator for the Cooperator's share of the non-cancelable obligations properly incurred by the Cooperator up to the effective date of the termination.

4. Notices: All written notices concerning this Agreement shall be delivered in person or sent by certified mail, return receipt requested, to the Parties as follows:

For the Commission:	For the Cooperator:
Arizona Game and Fish Department ATTN: Mr. Don Larsen 5000 W. Carefree Highway Phoenix, Arizona 85086 Phone: (623) 236-7624 Dlarsen@azgfd.gov	Boulder Ranch LLC [redacted]

5. In accordance with A.R.S. § 35-214, all books, accounts, reports, files, electronic data, and other records relating to this Agreement shall be subject at all reasonable times to inspection and audit by the State of Arizona for five (5) years after completion of this Agreement. Upon request, Party shall produce original of any and all such records.

6. In accordance with A.R.S. § 41-151.12 (GS 1018), all books, accounts, reports, files, electronic data, and other records relating to this Agreement shall be kept for six (6) years after completion of this Agreement.

7. Modifications within the scope of this Agreement shall be made by mutual consent of the Parties, by the issuance of a written modification, signed and dated by all Parties, prior to any changes being performed. The Parties are not obligated to fund any changes not approved in advance.

8. Every obligation of the Parties under this Agreement is conditioned upon the availability of funds appropriated or allocated for the payment of such obligation. If funds for the continuance of this Agreement are not allocated or are not available, this Agreement shall terminate automatically on the date of expiration of funding. In the event of such termination, the Parties shall incur no further obligation or liability under this Agreement other than for payment of services rendered prior to the expiration of funding.

9. All work performed pursuant to this Agreement shall be in compliance with all applicable state and federal laws and regulations.

10. This Agreement in no way restricts either Party from participating in similar activities with other public or private agencies, organizations, or individuals.

11. In carrying out the terms of this Agreement, the Parties agree to comply with State Executive Order 2009-09 and all other applicable Federal and State laws, rules and regulations, including the Americans with Disabilities Act.

12. This Agreement constitutes the entire Agreement between the Parties pertaining to the subject matter herein and accurately sets forth the rights, duties, and obligations of each Party. All prior or contemporaneous agreements and understandings, oral or written, are hereby superseded and merged herein. The provisions of this Agreement may be abrogated, modified, rescinded, or amended in whole or in part only by mutual written consent executed by the Parties.

13. In the event that any provision of this Agreement or portion thereof is held invalid, illegal, or unenforceable, such provision or portion thereof shall be severed from this Agreement and shall have no effect on the remaining provisions of this Agreement, which shall remain in full force and effect.

14. In accordance with A.R.S. § 12-1518, the Parties agree to resolve all disputes arising out of or relating to this Agreement through arbitration, after exhausting applicable administrative review except as may be required by other applicable statutes.

15. This Agreement is subject to termination pursuant to A.R.S. § 38-511.

16. All payments received by the Cooperator through this Agreement may be subject to federal and local income tax. Any questions regarding the tax status of payments should be directed to the Cooperator's personal tax consultant.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement as of the last signature date below, and each person signing this Agreement warrants that he/she has the capacity and authority to execute this Agreement and consummate the transactions contemplated herein.

APPROVED:

By: _____ Date 2/12/18

Boulder Ranch, LLC

[redacted]

APPROVED:

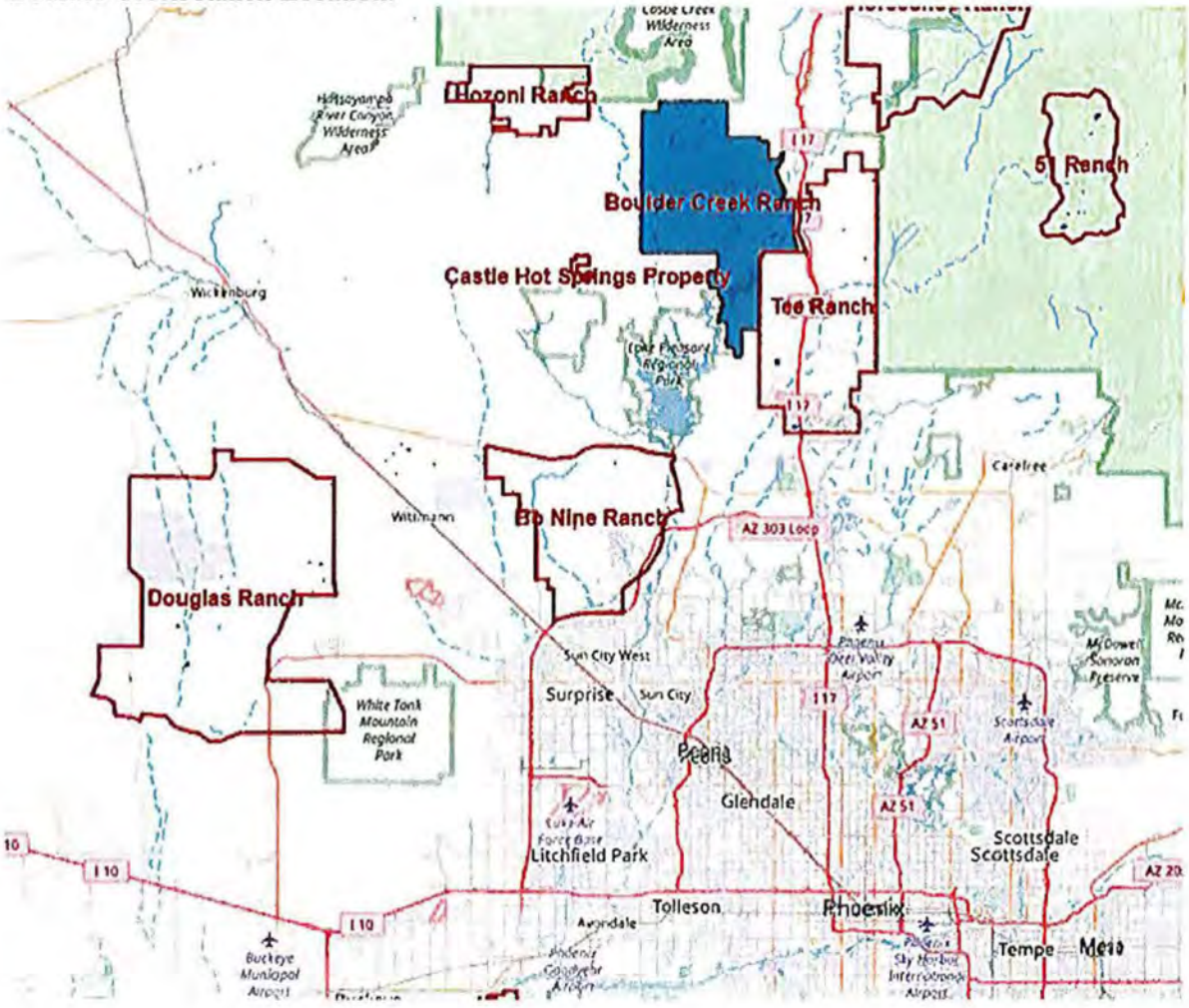
Arizona Game and Fish Department

By: _____ Date 9/7/18

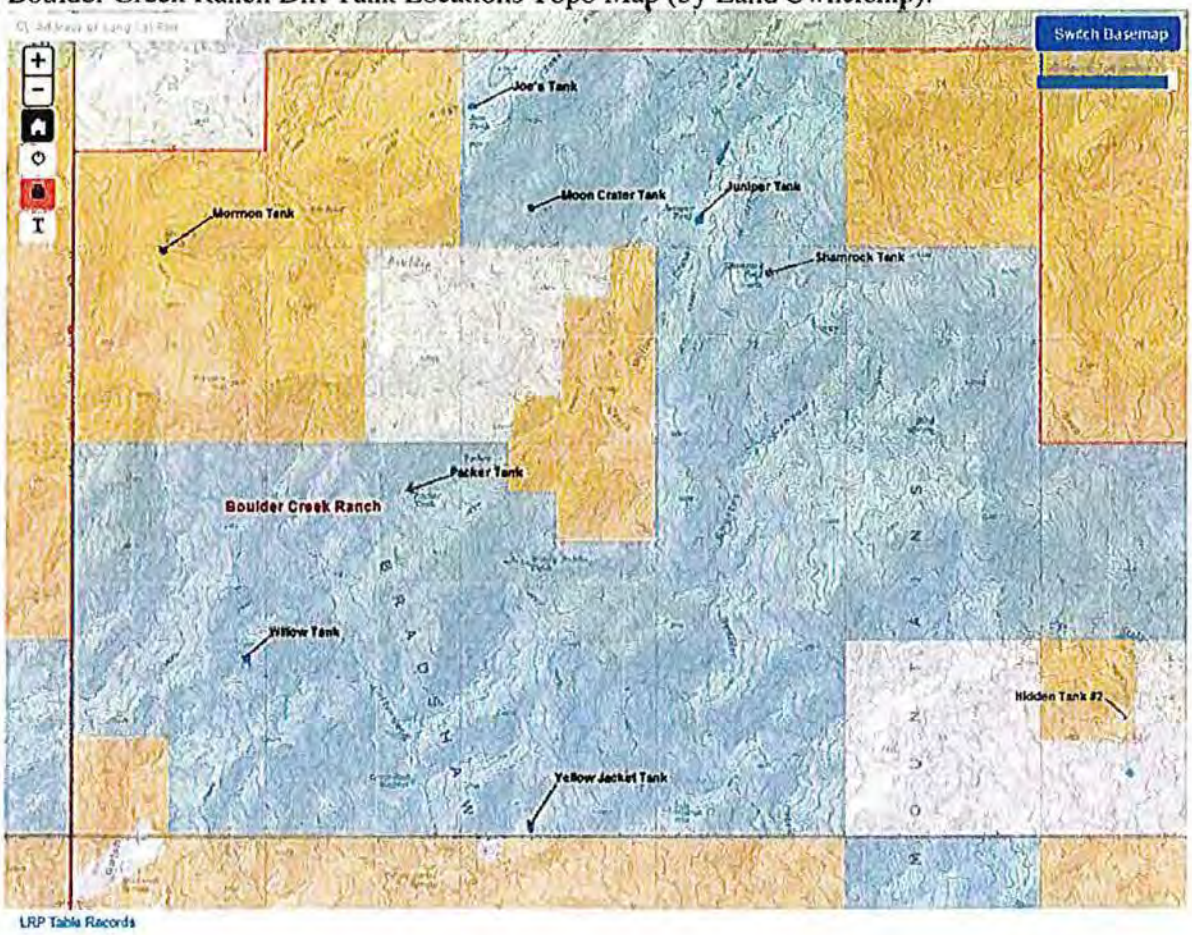
Jim deVos, Assistant Director
Wildlife Management Division

Exhibit A

Boulder Creek Ranch Location:



Boulder Creek Ranch Dirt Tank Locations Topo Map (by Land Ownership):



Dirt Tank Coordinates:

Hidden Tank #2	34 degrees 04' 45" N, 112 degrees 12' 46" W
Shamrock Tank	34 degrees 06' 42" N, 112 degrees 14' 43" W
Juniper Tank	34 degrees 06' 57" N, 112 degrees 15' 06" W
Joes Tank	34 degrees 07' 27" N, 112 degrees 16' 18" W
Moon Crater	34 degrees 07' 00" N, 112 degrees 15' 59" W
Mormon Tank	34 degrees 07' 28" N, 112 degrees 18' 57" W
Packer Tank	34 degrees 05' 45" N, 112 degrees 16' 39" W
Willow Tank	34 degrees 05' 00" N, 112 degrees 17' 30" W
Yellow Jacket	34 degrees 04' 16" N, 112 degrees 15' 59" W

EXHIBIT B

NRCS Best Practices and Specifications for Bentonite Sealant

CONSTRUCTION SPECIFICATION
SD-521 BENTONITE SEALANT

1. Scope

The work shall consist of applying and mixing bentonite, and compacting bentonite treated soil required by the drawings and specifications.

2. Material

Bentonite shall be free flowing, high swelling, granular sodium bentonite. Bentonite shall be American Colloid Company, Volclay SG-40; Wyo-Ben, Envirogel-10; or equivalent. The bentonite shall have a free swell of at least 18 cc / 2 gm as measured by ASTM Standard Test Method D 5890 and shall meet the following gradation:

Sieve Size	Percent Passing
10	100
20	60 - 100
200	0 – 20

3. Application

Bentonite shall be applied to soil that is free of vegetation, trash, roots, frozen material, stones over four inches in diameter, or other objectionable material. Slopes to be treated shall be flattened to 3:1 or flatter. Holes shall be filled with onsite compacted material. Surfaces shall be graded to remove irregularities and thoroughly tilled if necessary to reduce the soil to its native particle size.

Bentonite shall be spread uniformly at the specified application rate measured in pounds of bentonite per square foot of surface area per lift thickness. The amount of bentonite per lift and the number of lifts shall be as shown on the drawings.

The bentonite shall be uniformly spread on the surface using a truck drawn spreader box, agriculture lime spreader, mechanized conveyor-fed material spreader box or other type of drop spreader approved by the engineer or technician. Broadcast spreaders are not acceptable. Pre-measured tarpaulins or cloths placed in different locations shall be weighed after spreading material to verify that the specified application rate is met.

The bentonite may also be applied at the specified rate by distributing 100-pound bags of material in a marked grid pattern. Each bag shall be opened and the material spread evenly within each grid square, using hand rakes.

4. Mixing

Bentonite shall be thoroughly mixed with a rototiller, soil stabilizer or other similar mixing equipment approved by the engineer or technician. Small or medium sized tractor drawn rototillers are acceptable but self-propelled industrial rototillers are preferred. The rototiller shall be capable of digging to a depth at least equal to one compacted lift thickness. A minimum of two passes of the mixer shall be used. For the first pass set the mixing depth to approximately ½ of the full lift depth, then reset the mixer to full depth for the second pass. The speed of the mixer shall be adjusted to insure complete and

uniform mixing of the materials. Bentonite may be incorporated with stockpiled material and then placed in the desired area or incorporated with material in place, such as the sides and bottom of the pit.

To yield sufficient water content, bentonite shall be applied and mixed with a relatively dry soil, then watered, re-mixed and compacted. In certain instances it may be necessary to wet the soil previous to applying the bentonite to prevent the bentonite from "balling up". Conversely, it may be necessary to dry the soil to achieve the recommended moisture content. Practice runs are recommended with unfamiliar material to find the most desirable application mixing/(de)watering and re-mixing process.

A plant or pugmill type mixer may be used to produce the required soil-bentonite mixture as specified. Heavy silts or clay type materials shall pass through a soil pulverizer or hammermill to precondition the soil prior to introduction into the mixing chamber. The mixed soil bentonite material produced by a plant mixing system shall be directly transported to the job site and placed immediately to minimize moisture loss.

5. Compaction (Method Specification for Minor Structures)

Thickness of the finished, mixed, and compacted blanket shall be eight inches except as specified on the drawings. The blanket shall be constructed in four-inch or thinner lifts with each lift containing a proportionate share of the specified rate of bentonite per square foot of blanket (for example, add half of the bentonite to each four-inch lift of an eight-inch thick blanket).

Except as otherwise specified on the drawings, the methods of compaction of each layer of the blanket are intended to achieve 90 percent of maximum density as determined by Standard Proctor Test, ASTM D698.

Each bentonite treated soil layer shall have a water content sufficient to secure compaction. When kneaded in the hand, the mix must form a ball that does not readily separate when struck sharply with a pencil, and will not extrude out of the hand (as mud) when squeezed tightly.

When multiple lifts are specified or required, the interface between the lifts shall be roughened or scarified a minimum of ½ inch prior to placement of the next lift.

Compaction adjacent to structures protruding through the soil bentonite mixture shall be compacted to a density equivalent to that of the surrounding mixture by means of manually directed power tampers or plate vibrators.

Each lift shall be compacted by traversing the entire surface with not less than two passes of a pneumatic-tired roller exerting a pressure of not less than 50 pounds per square inch. A flat steel wheel roller exerting not less than 100 pounds per inch of width of roller, or a vibrating compactor may also be utilized on non-cohesive soils. Partially penetrating pad foot compactors, such as those found on landfill compactors, may be used on cohesive material or other suitable equipment approved by the engineer or technician may also be used.

Compaction with a sheepsfoot roller or a track type tractor shall not be allowed.

Except as otherwise specified on the drawings, a (minimum) 12 inch thick protective cover layer of soil shall be applied over the bentonite-treated blanket to protect the blanket from drying cracks.

6. **Bentonite Treated Linings for Waste Storage Applications (additional requirements)**

Except as shown on the drawings, the compacted lining must be at least 18 inches thick.
Except as otherwise shown on the drawings, linings for storage ponds must cover the pond bottom and interior side slopes of the pond up to the design storage elevation.
Except as shown on the drawings, the moisture content to achieve the most desirable impermeable compacted lining should be no drier than two percent above optimum moisture. Follow the specific moisture content requirements as specified for the project.
Foundation preparation - If in-place material is not suitable for lining, the material must be excavated to the depth needed to place lining below final design lines and grades.

7. **Testing for Waste Storage Applications (additional requirements)**

Density and moisture content of the fill may be tested during construction by the NRCS inspector following the methods described in ASTM D698 and D1556 or equivalent. Tests performed by the NRCS inspector will be used to verify that the treated linings conform to the plans and specifications and not as a replacement for the contractor's quality control program.

The contractor will be responsible for supplying adequate documentation to NRCS to certify moisture and compaction requirements have been met. Optimum Moisture, Maximum Density and associated test data will be furnished as described by ASTM D698, D1556, D2167, or equivalent.

8. **Amount of Testing to be Furnished by the Contractor for Waste Storage Applications (additional requirements)**

Proctor curves - A minimum of one Moisture - Density (ASTM D698) Standard Proctor Curve and associated test data must be prepared and furnished to NRCS for each type of material to be incorporated into the treated linings.
Permeability testing for bentonite treated linings - At least 1 permeability test (ASTM D3385, D5093, D5094 or equivalent) on the completed liner must be conducted per acre of liner, except the minimum number of permeability tests is 2. These tests must demonstrate that the pond liner, when full to the permanent storage level, will have a coefficient of permeability less than or equal to 1X10-7 cm/sec.

9. **SAFETY**

Dust masks and goggles are recommended to be worn by all personnel on the site during bentonite application and while mixing for protection against bentonite dust.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
ARIZONA

POND SEALING OR LINING – BENTONITE TREATMENT
(No.)

CODE 521C

DEFINITION

A liner for a pond or waste impoundment consisting of a compacted soil-bentonite mixture.

PURPOSE

To reduce seepage losses from ponds or waste impoundments for water conservation and environmental protection.

CONDITIONS WHERE PRACTICE APPLIES

This practice *may be applied as part of a conservation management system* where:

- Soils are suitable for treatment with bentonite.
- Ponds or waste impoundments require treatment to reduce seepage rates and to impede the migration of contaminants to within acceptable limits.

This practice has been determined to have no effect on federally listed species if installed outside of the designated 100-year flood plain. Additional determination of effect by NRCS and consultation with the Fish and Wildlife Service may be required for installation within the 100-year floodplain.

CRITERIA

General Criteria Applicable to All Purposes.

Structures and/or facilities shall be designed on an individual basis to meet site conditions and functional requirements. They shall be part of an approved and overall engineering plan for irrigation, drainage, wildlife, recreation, channel improvement, or similar purposes.

Design and implementation of subsidiary components and/or structures shall meet all applicable Natural Resource Conservation Service (NRCS) conservation practice standards. The criteria for the design of any components not specifically addressed in NRCS practice standards or specifications shall be consistent with sound engineering principles and/or manufacturer recommendations.

Laws and Regulations. Bentonite treated soil liners shall *be planned, designed and installed to* comply with all federal, State, *Tribal* and local laws, rules, regulations. *Laws and regulations of particular concern include those involving water rights, land use, pollution control, property easements, wetlands, preservation of cultural resources, and endangered species. State water quality standards for seepage loss shall be followed.*

The owner is responsible for securing necessary permits and water rights, complying with all laws and regulations, and meeting legal requirements applicable to the installation, operation, and maintenance of this practice and associated structures.

Design. *Design and implementation of bentonite* lined structures shall meet all applicable *Natural Resource Conservation Service (*NRCS) standards. *All inlets, outlets, ramps, and other appurtenances shall be installed in a manner that does not damage or impair the proper operation of the liner.*

Ponds to be treated shall be constructed to meet applicable standards for IRRIGATION PITS or REGULATING RESERVOIRS (552), IRRIGATION STORAGE RESERVOIRS (436), IRRIGATION SYSTEM, TAILWATER RECOVERY (447), PONDS (378), WASTE STORAGE PONDS (425), WASTE TREATMENT LAGOONS (359), TROUGH or TANK (614), as appropriate.

Bentonite treated soil liners shall be filter compatible with the natural foundation materials on which they are compacted according to Chapter 26 *(Gradation Design of Sand and Gravel Filters),* Part 633 *(Soil Engineering)* of

Investigations, Surveys and Design Criteria. *Documentation requirements will be as outlined below, in additional to the documentation requirements of the practice components used in the system.*

Make a preliminary site assessment or reconnaissance to determine if the practice is feasible, considering the field or system layout, soils, crops, topography, water supply, and may include:

1. *Soil borings, geological site investigation or soil survey, depending on existing site conditions or scope and complexity and to determine foundation materials or conditions or soil limitations (Soil classification by the Unified Soil Classification System).*
2. *Lining material selection, or alternatives.*
3. *Verify appropriate state laws for permitting and notify landowner of his/her responsibilities.*
4. *Verification or certification of used materials (if any)*

To adequately plan and layout this practice, a detailed topographic survey is required, that adequately details:

1. *Site topography, as needed to show the practice and component layout, physical features of the site (field boundaries and slope), including existing features/practices, ground elevations (slopes), location of any utilities or markers, etc.*
2. *Profiles and cross sections, as required to determine location, material quantities/sources, etc. Survey shall extend 100 feet (minimum) beyond the limits of the proposed lining;*
3. *If applicable, a permanent benchmark(s) may be set and described. Preferably, the elevations and coordinates should be based on a local (assumed) or coordinate system (State or grid) and clearly stated on the plan. Datum may be in the form of Northing and Easting coordinates or Longitude and Latitude.*

The design of a practice is the application of Field Office Technical Guide practice standards, and using experience and judgment in the development of a solution to the problem or the objective. All computations and decisions made during the design of a practice are to be checked by another qualified individual and appropriate notations made. Design computations, calculations or analysis shall meet the following criteria:

1. *Determine the size, type and lining material properties (thickness), including foundation or subgrade preparation requirements.*
2. *Include estimates of earthwork, pipe, fittings and appurtenances, concrete, vegetative components, etc.*
3. *Subsidiary and applicable components shall be designed in accordance with applicable conservation practice standards (i.e., pipelines shall meet the requirements of Conservation Practice 430 – Irrigation Pipeline, etc.),*

Installation and Basis of Acceptance. *For construction that does not meet State, OSHA, or Tribal criteria or requirements where deficient construction materials were used, NRCS may consider a waiver request for approval of construction after it has received a signed and sealed construction and/or material exemption from a licensed engineer. Required exemption shall be for installation of materials that do not meet minimum quality criteria as found in applicable Standards, Specifications, ASTM's, AWWA standards, etc.*

Contractors performing work under this practice shall abide by all Federal, State or Tribal laws or criteria, and must be licensed by the state DWR or board of technical registers where the work is being implemented

CONSIDERATIONS

Flattening the slopes of ponds or waste impoundments to facilitate compactive efforts during construction should be considered. The stair-step method of construction as outlined in *National Engineering Handbook Series, Part 651 (Agricultural Waste Management Field Handbook), Chapter 10 (Agricultural Waste Management System Component Design),* Appendix 10D *(Geotechnical, Design, and Construction Guidelines)* may be considered in lieu of slope flattening.

A protective compacted soil cover *(minimum 6-inch)* should be considered for protecting the soil-dispersant bentonite liner for ponds.

Consider using a flexible membrane liner for sites that have water depths greater than 24 feet.

Consider filling pond with water after construction to prevent desiccation.

Consider weather conditions such as wind and precipitation when planning construction.

Design alternatives presented to the client should address economics, ecological concerns and acceptable level of risk for design criteria as it relates to hazards to life or property.

PLANS AND SPECIFICATIONS

Use Arizona standard drawings to the extent possible. These may be supplemented by additional drawings or specification notes on the drawings to provide full installation instructions.

Construction plans shall include all components needed for the safe operation of the proposed improvements such as railing, fencing, or warning signs as appropriate. The plans shall address operations near existing utilities, trench excavations and any other items related to construction of the structure that may pose a safety risk to those involved.

Development of plans and specifications for bentonite treated soil liners for ponds and waste impoundments *will be guided by the National Engineering Handbook, Part 650, the Engineering Field Handbook, Chapter 5, and shall be in accordance with the National Engineering Manual, Parts 541 and 542, shall be prepared for specific field site,* shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. Plans and specifications shall include such drawings, specifications, material requirements, quantities, construction requirements, equipment requirements, and other documents as are necessary to describe the work to be done. *As a minimum, the plans and specifications shall provide the following:*

- *Project location map, including section, township and range, North arrow, cooperator/owner acknowledgement and certification signature blocks, engineering job class (cover sheet);*
- *References that the owner/cooperator are responsible for all permits, rights-of-way, easements and the contact, coordination and location determination of any existing utilities or clearances (buried utility disclaimer);*
- *If applicable, a map showing the location of the practice(s) or system in reference to a known or established benchmark or reference point with the location, description and elevation clearly shown. Topographical features and/or controls shall be shown, showing tie in with existing or other planned practices;*
- *Field surveys and notes, soil investigations or geologic soil boring locations and soil classifications, earthwork or material estimates/quantities (if applicable);*
- *Overall system plan view (i.e., layout of the containment structure, collection points, water transfer locations or pipelines, and topography of the site, required liner properties including details of the type and quality, cushion or padding materials, and pipeline materials, location and cross section of facility and liner showing dimensions and location of anchoring trenches, vents, depth of cover material and maximum storage depth of water or waste; special foundation or subgrade preparation and details, including tolerances on smoothness of the finished grade, details of liner installation, seaming requirements, and requirements for attachments and appurtenances; quality control testing, fence and signage requirements, if required; vegetative requirements; construction/installation criteria, State and Federal [OSHA] safety requirements, etc.), type, quality and quantity as necessary;*
- *Sufficient sectional, dimension or detail views of all system components and appurtenances (inlet and outlet pipes, method and details to protect liner including soil cover requirements, structural details, if required, drain and vent location and details, quality of materials, etc.) as required, for proper system functionality;*
- *Use Arizona Construction and Material Specifications for each item of work and material, as applicable and available. Additional specifications may need to be written to provide full material and installation instructions. Fill in blanks and add or delete items from the specifications to make them fit the job as needed.*

All designs completed by non-NRCS personal shall meet minimum State licensing board requirements and NRCS requirements and criteria as outlined in the General Manual, the National Engineering Manual (including Arizona

Supplements), and the National Engineering Handbook.

ONCE ALL PARTIES HAVE ACCEPTED AND SIGNED THE PLANS AND SPECIFICATIONS, NO CHANGES SHALL BE MADE TO THE DRAWINGS OR SPECIFICATIONS WITHOUT PRIOR APPROVAL OF NRCS.

OPERATION AND MAINTENANCE

A plan for operation and maintenance (O&M) of the liner and structure, specific to each site, shall be prepared and reviewed with the landowner, cooperator or individual responsible for operation and maintenance and shall be commensurate with the size and complexity of the project. The plan shall be consistent with the purposes of the type of liner chosen, intended life, safety requirements and design criteria. It shall document needed actions, including reference to periodic inspections and the prompt repair or replacement of damaged components, and should provide specific instructions for operating and maintaining facilities to ensure they function properly.

Maintenance activities required for this practice consist of those operations necessary to prevent damaging the treated soil liner. This includes, but is not limited to:

- excluding animals and equipment from the treated area,
- protection of the liner during initial filling, agitation, or pumping operations, and
- repair of disturbed or eroded areas.
- *Design capacity and liquid level of the structure.*
- *Periodic inspection of the following:*
  - *Visible portions of the liner for tears punctures, or other damage;*
  - *Liner interface with inlets, outlets, ramps, or other appurtenances for damage;*
  - *Liquid level in the structure;*
  - *Ballooning of the liner indicating presence of gas beneath the liner.*
- *Appurtenances such as trash racks, outlet structures, and valves shall be kept free of trash, debris, foreign materials or blockage and replaced when needed to prevent clogging of outlet and overflow pipes*
- *Eradicate or otherwise remove all rodents or burrowing animals that have or may potentially damage any part of the delivery or application facilities. Immediately repair any damage caused by their activity.*
- *The practice should be inspected periodically and especially after storm events to determine whether it is functioning properly or if repairs are needed.*
- *Immediately repair any damage resulting from vandalism, vehicles, or livestock.*

REFERENCES

- *Quality Assurance and Quality Control for Waste Containment Facilities, EPA/1600/R-93/182, September 1993.*
- *ASTM D5890*
- *NRCS, National Engineering Handbook – Part 633, Chapter 26.*
- *NRCS, "Agricultural Waste Management Field Handbook", National Engineering Handbook, Part 651.*
- *National Engineering Handbook - Part 650, Engineering Field Handbook, Chapter 1 – Engineering Surveys; Chapter 3 – Hydraulics; Chapter 4 – Elementary Soils Engineering, Chapter 5 – Preparation of Engineering Plans; Chapter 6 – Structures, Chapter 10 – Agricultural Waste, and Chapter 17 – Construction & Construction Materials*
- *National Engineering Manual, Part 531 Geology 531.31, USDA, Natural Resources Conservation Service*
- *USDA-NRCS, TR-62 Engineering Layout, Notes, Staking and Calculations,*
- *General Manual, Title 420-Part 401, Title 450-Part 401, Title 190-Parts 410.22 and 410.26*
- *National Environmental Compliance Handbook*
- *National Planning Procedures Handbook*
- *USDA NRCS, Engineering Design Standards – Far West States*
- *National Cultural Resources Handbook*